

Abstract of the Disclosure

A resonant tunneling diode, and other one dimensional electronic, photonic structures, and electromechanical MEMS devices, are formed as a heterostructure in a nanowhisker by forming length segments of the whisker with different materials having different band gaps. Thus a resonant tunneling diode comprises a nanowhisker having a seed particle melt at one end, and a column of a constant diameter with a nanometer dimension, such as to exhibit quantum confinement effects, the column comprising first and second semiconductor portions comprising respectively an emitter and a collector, and, disposed between the first and second semiconductor portions, third and fourth portions of material having a different band gap from that of the first and second semiconductor portions, and a fifth central portion of a semiconductor material having a different band gap from that of the third and fourth portions, disposed between the third and fourth portions and forming a quantum well. The RTD is made by a method including depositing a seed particle on a substrate, and exposing the seed particle to materials under controlled conditions of temperature and pressure

such as to form a melt with the seed particle, so that the seed particle rises on top of a column whereby to form a nanowhisker, the column of the nanowhisker having a constant diameter of a nanometer dimension; during the
5 growth of the column, selectively changing the compositions of said gases whereby to abruptly change the composition of the material of the column at regions along its length, whilst retaining epitaxial growth, wherein lattice mismatch between the materials of the
10 portions is accommodated by radial outward bulging of the whisker at the boundaries.